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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/810,355	03/25/2004	Lee Bindeman	LSTC-003	1255

37804 7590 11/01/2007

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EXAMINER	
DAY, HERNG DER	

ART UNIT	PAPER NUMBER
2128	

NOTIFICATION DATE	DELIVERY MODE
11/01/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/810,355	BINDEMAN, LEE	
	Examiner	Art Unit	
	Herng-der Day	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 July 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 March 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-15 were originally presented for examination.

2. Claims 1-15 were rejected.

3. Claims 1-15 are currently pending in Instant Application.

4. The Instant Application is not currently in condition for allowance.

Response to Arguments

5. Applicant's arguments filed July 10, 2007 with respect to 101 and 102 rejections have been fully considered but they are not persuasive for the reasons enumerated below.

Response: Drawings Objection

6. **Applicant argues (Drawings – Page 11 considering FIGS. 5A-5H):**

Applicant submits that FIGS. 5A- 5H contain a new feature used in the present invention. In particular, FIGS. 5A-5H list the equations used in the claimed method (i.e., claims 1-5).

7. **Examiner Response:**

At least FIGS. 5D-5E are still objected to. For example, the tables as shown in FIGS. 5D-5E can be found at page 235 of Belytschko et al., "Assumed strain stabilization of the eight node hexahedral element", IDS cited document filed June 21, 2004.

Response: 35 U.S.C. 101

8. **Applicant argues (section 101 – Page 12 considering claims 1-15):**

Claims 1-15 were rejected under 35 U.S.C. §101 as allegedly being directed to non-statutory subject matter. The currently amended independent claims 1,6 and 11 include a new feature in the preamble: "for controllin.q

hour,qlass deformations of a solid element in a finite element analysis for desi,qnin,q and analyzin,q a structural product", which shows the method or program code providing instructions to the method is used for designing and analyzing a structural product such as an automobile. In addition, a new limitation of claim 1 is reproduced as follows: "... wherein the set of counter nodal forces is used to offset the hourglass deformations such that the hour,qlass deformations are controlled in the finite element analysis of the structural product" (emphasis added). Because the present invention enables the control of the hour,qlass deformations in a finite element analysis of a structural product such as an automobile or airplane, the finite element analysis results can be used to study the physical behavior of the structural product when it is subjected to prescribed loads such as a surface forces, body forces and/or prescribed motions. If hourglass deformations are not controlled, their magnitude can grow very large relative to other modes of deformation thereby rendering the analysis results unusable due to large error in the deformed shape of the structural products. Therefore, the claimed invention has a useful, tangible real world value (e.g., reduce automobile design time) and result (e.g., meaningful numerical analysis for designing an automobile and its components). All of the dependent claims depend directly or indirectly to the independent claims.

9. **Examiner Response:**

The rejections under 35 U.S.C. 101 are maintained. Claims 1-15 are still directed specifically to an abstract method of mathematical algorithm of calculating nodal forces. The examiner submits that, it appears that Applicant is seeking patent protection for general mathematical algorithm of calculating nodal forces. Claims are directed to nothing more than abstract ideas (mathematical algorithm of calculating nodal forces). Abstract ideas are not eligible for patent protection. While abstract ideas, natural phenomena, and laws of nature are not eligible for patenting, methods and products employing abstract ideas, natural phenomena, and laws of nature to perform a real-world function may well be (MPEP, 2106).

MPEP 2106 recites the following:

A process that consists solely of the manipulation of an abstract idea is not concrete or tangible. See In re Warmerdam, 33 F.3d 1354, 1360, 31 USPQ2d 1754, 1759 (Fed. Cir. 1994). See also Schrader, 22 F.3d at 295, 30 USPQ2d at 1459. Office personnel have the burden to establish a prima facie case that the claimed invention as a whole is directed to solely an abstract idea or to manipulation of abstract ideas or does not

produce a useful result. Only when the claim is devoid of any limitation to a practical application in the technological arts should it be rejected under 35 U.S.C. 101. Compare ***Musgrave, 431 F.2d at 893, 167 USPQ at 289; In re Foster, 438 F.2d 1011, 1013, 169*** *USPQ 99, 101 (CCPA 1971). Further, when such a rejection is made, Office personnel must expressly state how the language of the claims has been interpreted to support the rejection."*

Response: 35 U.S.C. 102

10. **Applicant argues (section 102 – Page 19 considering claim 1):**

1) Nagtegaal discloses a special form of hourglass deformation control only applied for a 15-node second order tetrahedral element, while the present invention pertains to hourglass deformation control for solid element of different types (i.e., 8-node hexahedral, 6-node pentahedral, or 4-node 2-dimensional plane strain and axisymmetric elements).

11. **Examiner Response:**

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., 8-node hexahedral...) are not recited in the rejected claim 1. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

12. **Applicant argues (section 102 – Page 19 considering claim 1):**

2) Nagtegaal measures hourglass deformation as the difference between the position in space of mid-body node 11 and the position in space calculated by Equation (1), (Lines 34-38 Column 8 Nagtegaal) while the present invention uses only the corner nodes.

13. **Examiner Response:**

The position of each Nagtegaal's nodes is directly or indirectly obtained from the corner nodes. Accordingly, it anticipates the claimed limitation, "using ... difference between the initial nodal coordinates and the current nodal coordinates of corner nodes of the solid element".

14. **Applicant argues (section 102 – Page 20 considering claim 1):**

3) Nagtegaal uses a set of weighting or scaling factors (e.g., Atet, Btet, Atri, and Btri (lines 9 and 19, column 7 Nagtegaal)) in the calculation of Equations (1) and (2) for the hourglass deformation control. The set of the weighting factors is designed for the special case (i.e., 2nd order 10-node tetrahedral element). The set of weiqhting factors cannot be applied to any other type of element such as the solid element recited in claim 1.

15. **Examiner Response:**

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., specific type of solid element) are not recited in the rejected claim 1. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

16. **Applicant argues (section 102 – Page 20 considering claim 1):**

4) Nagtegaal calculates the hourglass strain with the current nodal coordinates as shown in Equation (9), while the present invention uses a difference between the current nodal coordinates and the initial nodal coordinates of corner nodes of the solid element.

17. **Examiner Response:**

Applicant has not claimed any specific equation and the position of each Nagtegaal's nodes is directly or indirectly obtained from the corner nodes. Accordingly, it anticipates the

claimed limitation, "using ... difference between the initial nodal coordinates and the current nodal coordinates of corner nodes of the solid element".

Response: 35 U.S.C. 103

18. **Applicant argues (section 103 – Pages 21-22 considering claim 2):**

Prior art disclosures on the Internet or on an on-line database are considered to be publicly available as of the date the item was publicly posted. Absent evidence of the date that the disclosure was publicly posted, if the publication itself does not include a publication date (or retrieval date), it cannot be relied upon as prior art under 35 U.S.C. 102(a) or (b)." MPEP 2128. Since the Examiner relied on Forssell, an Internet document without publication date, to reject claim 2. Applicant respectfully submits that the publication date of Forssell needs to be established; otherwise, Forssell does not qualify as a 102(a) or (b) reference.

19. **Examiner Response:**

MPEP 2128: Date of Availability

Prior art disclosures on the Internet or on an on-line database are considered to be publicly available as of the date the item was publicly posted. Absent evidence of the date that the disclosure was publicly posted, if< the publication >itself< does not include a publication date (or retrieval date), it cannot be relied upon as prior art under 35 U.S.C. 102(a) or (b).

Examiner submits that applicant's interpretation of the section from the MPEP is not correct. The evidence of publicly available date of Forssell et al. ("Creating a New Element Type", http://web.archive.org/web/20030214185408/http://impact.sourceforge.net/Manual_Programmers/Element.html) can be obtained via Wayback machine (http://www.archive.org/index.php). The version of Forssell used by the examiner is dated on 02/14/2003.

20. **Applicant argues (section 103 – Page 23 considering claims 5, 10 and 15):**

Hughes teaches a traditional 8-node element whose hourglass deformation cannot be controlled by the method taught in Nagtegaal. ... One cannot apply the weighting factors from Nagtegaal to an 8-node hexahedral element".

21. **Examiner Response:**

Applicant's arguments with respect to claims 5, 10, and 15 have been considered but are moot in view of the new ground(s) of rejection.

Drawings

22. Figures 5D and 5E should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

23. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

24. Claim 7 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 recites the limitation "the set of nodal forces" in line 9 of the claim. It is indefinite because it is unclear whether "the set of nodal forces" is referred to "a set of generalized hourglass forces" as recited in line 21 of claim 6 or "a set of counter nodal forces" as recited in line 24 of claim 6. For the purpose of claim examination, the Examiner will presume that "the set of nodal forces" is referred to "a set of counter nodal forces" as recited in line 24 of claim 6.

Claim Rejections - 35 USC § 101

25. U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

26. Claims 1-15 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 1-15 are directed to the manipulation of abstract ideas for controlling hourglass deformations of a solid element. This claimed subject matter lacks a practical application of a judicial exception (law of nature, abstract idea, naturally occurring article/phenomenon) since it fails to produce a useful, concrete, and tangible result.

As stated in the MPEP 2106 IV, "Likewise, a claim that can be read so broadly as to include statutory and nonstatutory subject matter must be amended to limit the claim to a practical application. In other words, if the specification discloses a practical application of a

section 101 judicial exception, but the claim is broader than the disclosure such that it does not require a practical application, then the claim must be rejected." and "The tangible requirement does not necessarily mean that a claim must either be tied to a particular machine or apparatus or must operate to change articles or materials to a different state or thing. However, the tangible requirement does require that the claim must recite more than a 35 U.S.C. 101 judicial exception, in that the process claim must set forth a practical application of that judicial exception to produce a real-world result. Benson, 409 U.S. at 71-72, 175 USPQ at 676-77 (invention ineligible because had "no substantial practical application.")."

Specifically, the claimed subject matter describes nothing more than the manipulation of abstract ideas for controlling hourglass deformations of a solid element, which are basic mathematical constructs. More specifically, the claimed subject matter provides for calculating a set of counter nodal forces. This produced result remains in the abstract.

Furthermore, it appears that Applicant is seeking patent protection for general mathematical algorithm of calculating nodal forces, therefore, claims 1-15 are not for a particular practical application of the idea of calculating nodal forces embodied therein but seeking to patent substantially every application of the idea of calculating nodal forces, which is an attempt to patent the idea itself and is not permitted. Diehr, 450 U.S. at 191, 209 USPQ at 10. Benson, 409 U.S. at 71-72, 175 USPQ at 676; cf. Diehr, 450 U.S. at 187, 209 USPQ at 8.

Claim Rejections - 35 USC § 102

27. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

28. Claims 1, 5, 6, 10, 11, and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Nagtegaal (U.S. Patent 6,044,210).

Consider claim 1, 6 and 11, Nagtegaal discloses a method for controlling hourglass deformations of a solid element in a finite element analysis for designing and analyzing a structural product; software product (col. 4 lines 64-66) embodied in a tangible computer readable storage medium (FIG. 11) and executing in a computing device for controlling hourglass deformations of a solid element in finite element analysis for designing and analyzing a structural product; a system (FIG. 11) for controlling hourglass deformations of a solid element in a finite element analysis for designing and analyzing a structural product, the system comprising:

An I/O interface (FIG. 12);

A data communications interface (FIG. 12);

A memory for storing computer readable code for an application module (FIG. 12);

At least one processor (FIG. 12, CPU 250) coupled to the memory, the I/O device and the data communications interface, said at least one processor executing the computer readable code in the memory to cause the application module to perform operations of:

establishing a local initial element coordinate system of the solid element for an initial undeformed geometry of the solid element (FIG. 1A-D, tetrahedral elements, col. 5 lines 41-49);

establishing a local current element coordinate system of the solid element for a current deformed geometry of the solid element (col. 7 lines 54-64, constrained coordinates where using coordinate of nodes to define element coordinates);

calculating a set of initial nodal coordinates of the solid element in the local initial element coordinate system (FIG. 1, 4, element divided into structure of nodes, initial coordinate of nodes, col. 6 lines 65-67);

calculating a set of current nodal coordinates of the solid element in the local current element coordinate system (col. 7 lines 54-64, constrained coordinates of nodes);

evaluating a set of hourglass shape vectors of the solid element from the initial nodal coordinates (hourglass vector, FIG. 10, S70);

calculating a set of hourglass deformation magnitudes of the solid element using the set of hourglass shape vectors, and difference between the initial nodal coordinates and the current nodal coordinates of nodes of the solid element (hourglass strain, FIG. 10, S72).

evaluating a set of generalized hourglass forces (hourglass force, S74, FIG. 10) from the hourglass deformation magnitudes, the initial nodal coordinates, and material constants of the solid element (D material moduli, col. 9 line 61) and;

calculating a set of counter nodal forces (hourglass force vector, S78, FIG. 10) in the local current element coordinate system from the generalized hourglass forces and the hourglass shape vectors, wherein the set of counter nodal forces is used to resist the hourglass deformations such that the hourglass deformations are controlled in the finite element analysis of the structural product (col. 6 lines 48-53).

Consider claim 5, 10 and 15, Nagtegaal further discloses wherein the solid element is chosen from the group consisting of three-dimensional 8-node hexahedral element, 6-node three-dimensional pentahedral element, two-dimensional 4-node plane strain element and two-dimensional 4-node axisymmetric continuum element (FIG. 4, tetrahedral element; when the

tetrahedral element is in a thin plate or a shell, it is equivalent to a two-dimensional solid element with four nodes).

Claim Rejections - 35 USC § 103

29. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

30. Claims 2, 7, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagtegaal (U.S. Patent 6,044,210) as applied to claims 1, 6, and 11 above, and further in view of Forssell et al. ("Creating a New Element Type", http://web.archive.org/web/20030214185408/http://impact.sourceforge.net/Manual_Programmers/Element.html).

Consider claim 2, 7 and 12, Nagtegaal discloses the method of claim 1, a software product of claim 6, and the system of claim 11 (see rejections above).

Nagtegaal fails to discloses calculating transforming the set of nodal forces from the current element coordinate system to global coordinate system before adding to global force array.

Forssell et al. discloses calculating nodal forces (P. 5 "calculate Nodal Forces") and transform to global coordinate system before adding to the node (P. 4. "this is needs to be calculated in three dimensions and then transformed to the global xyz coordinate system before adding it to the node", P.5 "...transforming this force to global coordinates...", "add this force contribution to the nodes").

Nagtegaal and Forssll et al. are analogous art because they are both related to finite element simulation (Forsell et al., P.1).

Therefore, it would be have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the force transformation to global coordinate as taught by Forsell et al. for the method of controlling hourglass deformation of Nagtegaal, for the benefit of calculating and adding the element internal forces to the nodes (P. 5, steps of calculating and adding forces to the nodes).

31. Claims 3-4, 8-9, and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagtegaal (U.S. Patent 6,044,210) in view of Belytschko ("Element Technology" http://www.tam.northwestern.edu/tb/Book/Chapter%208.pdf).

Consider claim 3, 8 and 13, Nagtegaal discloses the method of claim 1, a software product of claim 6, and the system of claim 11.

Nagtegaal fails to calculate all terms of an element stabilization matrix for the solid element from the hourglass shape vectors, the initial nodal coordinates, and material constants of the solid element.

Belytschko discloses calculating all terms of an element stabilization matrix (P. 34, equation (1.3.21c) for the solid element from the hourglass shape vectors (B matrix P. 34), the initial nodal coordinates (B matrix is derived from nodal coordinates) , and material constants of the solid element (constants C, P 34).

Nagtegaal and Belytschko are analogous art because they are both related to finite element analysis.

Therefore, it would be have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the calculation of stabilization matrix as taught by

Belytschko for the method of controlling hourglass deformation of Nagtegaal because stabilization matrix is used to obtain elements which are of high accuracy (P. 5, first paragraph, lines 5-9).

Consider claim 4, 9 and 14, Belytschko discloses transforming the stabilization matrix from the initial element coordinate system (the coordinate system of stabilization matrix calculated) to global coordinate system before adding the terms of the stabilization matrix into global stiffness matrix (P48. "In order to add the element stabilization matrix to the global stiffness matrix, it must be transformed back to the global coordinate system").

Conclusion

32. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

33. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Herng-der Day whose telephone number is (571) 272-3777. The Examiner can normally be reached on 9:00 - 17:30.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: (571) 272-2100.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Kamini S. Shah can be reached on (571) 272-2279. The fax phone numbers for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Herng-der Day H.D.
October 26, 2007

KAMINI SHAH
SUPERVISORY PATENT EXAMINER